

PENDING CLAIMS

This listing of claims will replace all prior versions, and listings, of claims in the application:

1. (Currently Amended) A method of operating an end node in a communications system including at least one network node and said end node, the method comprising:

generating, from Mobile IP signals directed to said end node or transmitted by said end node, a list of network nodes identifying network nodes used in routing signals to or from said end node, said Mobile IP signals including at least one of a Mobile IP agent solicitation message, a Mobile IP agent advertisement message, a Mobile IP registration message and a Mobile IP registration reply message;

receiving a fault signal indicating a network node fault;

determining, using said generated list, if the network node fault corresponds to a network node that is used in routing signals to or from said end node; and

if it is determined that the network node fault corresponds to a network node that is important to used in routing of signals to or from said end node, operating the end node to initiate a fault response operation.

2. (Previously Presented) The method of claim 1, wherein said determining step includes:

comparing network node information included in the received fault signal to information in said generated list identifying at least one network node used in routing signals to or from said end node.

3. (Previously Presented) The method of claim 2, further comprising:

determining said fault response operation as a function of information stored in said end node, said stored information relating to a plurality of possible operations.

4. (Currently Amended) A communications method for use in a communications system including at least one network node and one end node, the method comprising:

operating an end node to receive a fault signal indicating a network node fault;

determining if the network node fault corresponds to a network node that is used in routing signals to or from said end node; and

if it is determined that the network node fault corresponds to a network node that is ~~important to used in~~ routing of signals to or from said end node, operating the end node to initiate a fault response operation;

wherein said step of determining if the network node fault corresponds to a network node that is ~~important to used in~~ routing of signals to or from said end node includes:

comparing network node information included in the received fault signal to stored information identifying at least one network node used in routing signals to or from said end node,

determining said fault response operation as a function of fault response information stored in said end node, said stored fault response information relating to a plurality of possible operations; and

wherein said step of determining said fault response operation is also performed as a function of the network node at which the fault occurred with said operation being elected from a plurality of possible operations based on both the type of fault and which one of a plurality of network nodes was the node at which the fault occurred.

5. (Currently Amended) The method of claim 2, wherein said stored information identifying at least one network node used in routing ~~of~~ signals to or from said end node includes:

a list of network nodes ~~important to used in~~ the routing of signals to said end node.

6. (Currently Amended) A communications method for use in a communications system including at least one network node and one end node, the method comprising:

operating an end node to receive a fault signal indicating a network node fault;

determining if the network node fault corresponds to a network node that is used in routing signals to or from said end node; and

if it is determined that the network node fault corresponds to a network node that is ~~important to used in~~ routing of signals to or from said end node, operating the end node to initiate a fault response operation;

wherein said step of determining if the network node fault corresponds to a network node that is ~~important to used in~~ routing of signals to or from said end node includes:

comparing network node information included in the received fault signal to stored information identifying at least one network node used in routing signals to or from said end node, said stored information including a list of network nodes ~~important to used in~~ the routing of signals to said end node; and

wherein said stored information includes information identifying a network node, in said list of network nodes, which is used by said end node as at least one of a Mobile IP home agent, a Session Initiation Protocol proxy server, and a Session Initiation Protocol location registrar.

7. (Original) The method of claim 5, wherein said stored information includes information identifying a network node which is used by said end node as an access node through which said end node is coupled to other nodes in the communications network.

8. (Original) The method of claim 7, wherein the access node is a base station and wherein said end node is a mobile device that is coupled to said base station by a wireless communications link.

9. (Currently Amended) The method of claim 4, further comprising the step of:

dynamically generating at least a portion of said stored information identifying network nodes ~~important to used in~~ routing of signals to or from said end node from information included in sign is sent to or from said end node.

10. (Original) The method of claim 9, wherein said step of dynamically generating at least a portion of said stored information identifying network nodes includes:

operating the end node to monitor for non-fault related signals and to generate at least some of said stored information from the monitored non-fault related signals.

11. (Original) The method of claim 10, wherein said non-fault related signals include session signaling messages communicated to or from said end node.

12. (Original) The method of claim 10, wherein said non-fault related signals are routing messages.

13. (Currently Amended) A communications method for use in a communications system including at least one network node and one end node, the method comprising:

operating an end node to receive a fault signal indicating a network node fault;

determining if the network node fault corresponds to a network node that is used in routing signals to or from said end node; and

if it is determined that the network node fault corresponds to a network node that is important to used in routing of signals to or from said end node, operating the end node to initiate a fault response operation, said fault response operation being a Mobile IP registration operation.

14. (Currently Amended) A communications method for use in a communications system including at least one network node and one end node, the method comprising:

operating an end node to receive a fault signal indicating a network node fault;

determining if the network node fault corresponds to a network node that is used in routing signals to or from said end node; and

if it is determined that the network node fault corresponds to a network node that is important to used in routing of signals to or from said end node, operating the end node to initiate a fault response operation, said fault response operation being an end node state update operation.

15. (Previously Presented) The method of claim 6, further comprising the steps of:

sending a status request signal from a first network node to a second network node;

receiving a response to said status request signal; and

sending a network node fault signal to said end node when said response indicates a fault condition.

16. (Previously Presented) The method of claim 6, further comprising the steps of:

periodically sending a status request signal from a first network node to a second network node; and

sending a network node fault signal to said end node when a response to at least one of

said periodically received status request signals is not received.

17. (Original) The method of claim 16, further comprising the steps of:

maintaining a count of the number of consecutive status request signals sent to said second node for which a response is not received; and

wherein said sending a network node fault signal is performed in response to determining that said maintained count at least equals a threshold number.

18. (Original) The method of claim 1, further comprising the steps of:

receiving a fault signal at a first network node; and

sending a network node fault signal to said end node in response to receiving a fault signal.

19. (Original) The method of claim 18, wherein said step of sending a network node fault signal includes periodically sending fault signals to a plurality of end nodes at preselected time intervals.

20. (Original) The method of claim 19, further comprising:

operating at least some of said plurality of end nodes to monitor for fault signals at said preselected time intervals but not between said preselected time intervals.

21. (Original) The method of claim 20; wherein said fault signals are messages, each message including at least one IP packet.

22. (Previously Presented) The method of claim 6, wherein said fault signal is a multicast signal, the method further comprising:

operating a plurality of additional end nodes to receive said fault signal; and

operating each of the additional end nodes, in said plurality of additional end nodes, to determine if the network node fault corresponds to a network node that is used in routing of messages to or from said additional end node.

23. (Previously Presented) The method of claim 22, further comprising:
operating each additional end node which determines that the network node fault corresponds to a network node that is used in routing of messages to or from said additional end node, to initiate a fault response operation at said additional end node.

24. (Original) The method of claim 22, wherein each of said plurality of additional end nodes monitors for said fault signal at periodic scheduled times.

25. (Previously Presented) A communications method for use in a communications system including at least one network node and one end node, the method comprising:

operating an end node to receive a service interference notification signal indicating interference with service at a network node;

determining if the indicated service interference corresponds to a network node that is used in routing signals to said end node;

if it is determined that the indicated network node service interference corresponds to a network node that is used in routing signals to said end node, operating the end node to initiate a fault response operation; and

wherein said step of determining said fault response operation includes accessing stored information identifying a plurality of possible operations and selecting from the plurality of possible operations the operation to be performed based on both the type of fault and which one of a plurality of network nodes was the indicated network node at which the fault occurred.

26. (Original) The communications method of claim 25, wherein said service interference notification signal is a fault message indicating a service outage at said network node due to a network node fault.

27. (Currently Amended) The method of claim 26, wherein said step of determining if the indicated service interference corresponds to a network node that is ~~critical used in routing signals~~ to said end node includes:

comparing network node information included in the received message to stored information identifying network nodes ~~critical used in routing signals~~ to said end node.

28. (Currently Amended) The method of claim 27, wherein a network node is ~~critical~~ used in routing signals to said end node if said network node is necessary for proper routing of at least some signals to said end node.

29. (Canceled)

30. (Original) The method of claim 25, wherein said stored information includes information identifying a network node which is used by said end node as at least one of a Mobile IP home agent, a Session Initiation Protocol proxy server and a Session Initiation Protocol location registrar.

31. (Currently Amended) A communications method for use in a communications system including at least one network node and one end node, the method comprising:

operating an end node to receive a service interference notification signal indicating interference with service at a network node;

determining if the indicated service interference corresponds to a network node that is used in routing signals to said end node;

if it is determined that the indicated network node service interference corresponds to a network node that is used in routing signals to said end node, operating the end node to initiate a fault response operation; and

wherein said end node is a mobile node connected by a wireless communications link to an access node that is coupled to said indicated network node, said mobile node including a stored list of ~~critical~~ nodes used in routing signals and actions to be taken in response to faults at said listed ~~critical~~ nodes.

32. (Original) The method of claim 31, further comprising:

generating at least a portion of said stored information identifying network nodes from at least one of a Mobile IP agent solicitation message, Mobile IP agent advertisement message, Mobile IP registration message and a Mobile IP registration reply message communicated between said end node and said access node over the wireless communications link.

33. (Currently Amended) The method of claim 25, further comprising the step of:

dynamically generating at least a portion of said stored information identifying network nodes ~~critical~~ used in routing signals to said end node from information included in signals sent to or from said end node.

34. (Original) A communications method for use in a communications system including at least one network node and one end node, the method comprising:

operating an end node to receive a service interference notification signal indicating interference with service at a network node;

determining if the indicated service interference corresponds to a network node that is used in routing signals to said end node;

if it is determined that the indicated network node service interference corresponds to a network node that is used in routing signals to said end node, operating the end node to initiate a fault response operation; and

wherein said fault response operation is a Mobile IP registration operation.

35. (Original) The method of claim 25, further comprising:

operating said end node to monitor for service interference signals at preselected time intervals but not between said preselected time intervals.

36. (Previously Presented) The method of claim 25, wherein said service interference signal is a multicast signal, the method further comprising:

operating a plurality of additional end nodes to receive said service interference notification signal; and

operating each of the additional end nodes, in said plurality of additional end nodes, to determine if the indicated network node service interference corresponds to a network node that is used in routing of messages to or from said additional end node.

37. (Previously Presented) The method of claim 36, further comprising:

operating each additional end node which determines that the service interference

notification signal corresponds to a network node that is used in-routing of messages to or from said additional end node, to initiate a fault response operation at said additional end node.

38. (Original) The communications method of claim 25, wherein said service interference notification signal is a message indicating a scheduled service outage at said network node.

39. (Currently Amended) A mobile communications device, comprising:

means for storing a set of information indicating network nodes which are used in routing of signals either to said mobile communications device or from said mobile communications device to other network nodes;

means for [[for]] receiving messages from network nodes including service interference notification messages indicating service interference at a network node;

means for generating, from Mobile IP signals directed to said end node or transmitted by said end node, a list of network nodes identifying network nodes used in routing signals to or from said mobile communications ~~device~~ device, said Mobile IP signals including at least one of a Mobile IP agent solicitation message, a Mobile IP agent advertisement message, a Mobile IP registration message and a Mobile IP registration reply message; ~~and~~

means for processing received service interference notification messages to determine, using said generated list, if service interference indicated by a received network service interference notification message indicates service interference at a network node used in routing of signals either to said ~~mobile~~ mobile communications device or from said mobile communications device to another network node; ~~and~~

means for initiating a fault response operation.

40. (Previously Presented) The mobile communications device of claim 39,

wherein said device includes a wireless transmitter; and

wherein means for receiving includes a radio receiver circuit.

41. (Previously Presented) The mobile communications device of claim 40, further comprising:

means for controlling the mobile communications device to monitor for said service

interference notification messages at preselected intervals but not between said preselected time intervals.

42. (Currently Amended) A mobile communications device comprising:

memory including a set of stored information indicating network nodes which are used in routing of signals either to said communications device or from said communications device to other network nodes;

receiver circuitry for receiving messages from network nodes including service interference notification messages indicating service interference at a network node; and

a processor module for processing received service interference notification messages to determine if service interference indicated by a received network service interference notification message indicates service interference at a network node used in routing of signals either to said communications device or from said communications device to another network node, and for initiating a fault response operation; and

wherein said set of stored information includes information identifying a network node which is used by said end node as at least one of a Mobile IP home agent, a Session Initiation Protocol proxy server and a Session Initiation Protocol location registrar.

43. (Currently Amended) The communications device of claim 42, further comprising:

means for generating at least a portion of said set of stored information indicating network nodes which [[are]] are used in routing ~~of~~ signals from at least one of a Mobile IP signal and a Session Initiation Protocol signal.

44. (Previously Presented) The communications device of claim 43, wherein said communications device is a mobile node connected by a wireless communications link to an access node that is coupled to said indicated network node, said set of stored information including fault response actions to be taken to respond to faults at network nodes used in routing of IP packets to said mobile node.

45. (Previously Presented) The communications device of claim 44, wherein one of said fault response actions is a Mobile IP registration operation.

46. (Currently Amended) A device including a processor configured to control an end node in a communications system including at least one network node and said end node to implement a method, the method comprising:

generating, from Mobile IP signals directed to said end node or transmitted by said end node, a list of network nodes identifying network nodes used in routing signals to or from said end node, said Mobile IP signals including at least one of a Mobile IP agent solicitation message, a Mobile IP agent advertisement message, a Mobile IP registration message and a Mobile IP registration reply message;

receiving a fault signal indicating a network node fault;

determining, using said generated list, if the network node fault corresponds to a network node that is used in routing signals to or from said end node; and

if it is determined that the network node fault corresponds to a network node that is important to used in routing of signals to or from said end node, operating the end node to initiate a fault response operation.

47. (Previously Presented) The device of claim 46, wherein said method further comprises:

comparing network node information included in the received fault signal to information in said generated list identifying at least one network node used in routing signals to or from said end node.

48. (Currently Amended) A computer readable medium embodying machine executable instructions for controlling an end node in a communications system including at least one network node and said end node to implement a method, the method comprising:

generating, from Mobile IP signals directed to said end node or transmitted by said end node, a list of network nodes identifying network nodes used in routing signals to or from said end node, said Mobile IP signals including at least one of a Mobile IP agent solicitation message, a Mobile IP agent advertisement message, a Mobile IP registration message and a Mobile IP registration reply message;

receiving a fault signal indicating a network node fault;

determining, using said generated list, if the network node fault corresponds to a network

node that is used in routing signals to or from said end node; and

if it is determined that the network node fault corresponds to a network node that is important to used in routing of signals to or from said end node, operating the end node to initiate a fault response operation.

49. (Previously Presented) The computer readable medium of claim 48, wherein said method further comprises:

comparing network node information included in the received fault signal to information in said generated list identifying at least one network node used in routing signals to or from said end node.

50. (Currently Amended) A device including a processor configured to control an end node in a communications system including at least one network node and said end node to implement a method, the method comprising:

receiving a fault signal indicating a network node fault;

determining if the network node fault corresponds to a network node that is used in routing signals to or from said end node; and

if it is determined that the network node fault corresponds to a network node that is important to used in routing of signals to or from said end node, operating the end node to initiate a fault response operation;

wherein said step of determining if the network node fault corresponds to a network node that is important to used in routing of signals to or from said end node includes:

comparing network node information included in the received fault signal to stored information identifying at least one network node used in routing signals to or from said end node,

determining said fault response operation as a function of fault response information stored in said end node, said stored fault response information relating to a plurality of possible operations; and

wherein said step of determining said fault response operation is also performed as a function of the network node at which the fault occurred with said operation being selected from a plurality of possible operations based on both the type of fault and which one of a plurality of

network nodes was the node at which the fault occurred.

51. (Currently Amended) A computer readable medium embodying machine executable instructions for controlling an end node in a communications system including at least one network node and said end node to implement a method, the method comprising:

receiving a fault signal indicating a network node fault;

determining if the network node fault corresponds to a network node that is used in routing signals to or from said end node; and

if it is determined that the network node fault corresponds to a network node that is ~~important to used in~~ routing of signals to or from said end node, operating the end node to initiate a fault response operation;

wherein said step of determining if the network node fault corresponds to a network node that is ~~important to used in~~ routing of signals to or from said end node includes:

comparing network node information included in the received fault signal to stored information identifying at least one network node used in routing signals to or from said end node,

determining said fault response operation as a function of fault response information stored in said end node, said stored fault response information relating to a plurality of possible operations; and

wherein said step of determining said fault response operation is also performed as a function of the network node at which the fault occurred with said operation being selected from a plurality of possible operations based on both the type of fault and which one of a plurality of network nodes was the node at which the fault occurred.

52. (Currently Amended) A mobile communications device, comprising:

memory including a set of stored information indicating network nodes which are used in routing of signals either to said mobile communications device or from said mobile communications device to other network nodes;

receiver circuitry for receiving messages from network nodes including service interference notification messages indicating service interference at a network node;

a list generation module for generating, from Mobile IP signals directed to said end node

or transmitted by said end node, a list of network nodes identifying network nodes used in routing signals to or from said mobile communications device, said Mobile IP signals including at least one of a Mobile IP agent solicitation message, a Mobile IP agent advertisement message, a Mobile IP registration message and a Mobile IP registration reply message; and

a processor for processing received service interference notification messages to determine, using said generated list, if service interference indicated by a received network service interference notification message indicates service interference at a network node used in routing of signals either to said mobile communications device or from said mobile communications device to another network node, and for initiating a fault response operation.

53. (Previously Presented) The mobile communications device of claim 52,

wherein said device includes a wireless transmitter; and

wherein said receiver circuitry includes a radio receiver circuit.